



Data Sheet

Man machine interface display – Mitsubishi FX PLC

Supplied to **RS** by Mitsubishi Electric (UK) Ltd

This fully interactive man machine interface display is used for machine operators or others to see easily and clearly the state of the machine operation on the large backlight display and to enter instructions and information into the PLC.

Benefits of the display include:

- **Easy to install** – brackets for panel mounting included
- **Easy to connect** – connects into the programming part of any FX PLC base unit using the cable supplied. The display can be powered from the base unit
- **Easy to program and edit** – large user keys, menu driven displays, up to 256 screens available. PC based programming software is available
- **Easy to use** – range of PLC objects can be displayed plus monitoring function and graphical displays.

Please see current **RS** Catalogue for information and data sheet numbers for the Mitsubishi FX PLC range and other Mitsubishi ranges.

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Product	RS stock no.	Mitsubishi no.	Description and features
Display	199-481	FX-40DU-E	LCD display and function keys directly connected into FX PLC
Programming software	849-142	FX-PCS-DU/AT-EE	PC based programming software for FX-40DU-E

1. Display overview

The display has 4 different areas:-

User screen display

- 7 lines of 30 characters; the LCD screen has a resolution of 240 dots by 120 dot and is brightly backlit
- 256 user screens can be stored in the resident EPROM memory; screens can be overlaid
- Screens are built up and displayed
- Screen objects can be displayed: Text, ASCII, numbers, date, switches, data registers, simple graphics such as lines and circles and bar graphs
- Values can be displayed and changed, data can be sent to the PLC and input or outputs can be forced ON or OFF
- Auto screen switch off to conserve backlight life.

Monitoring

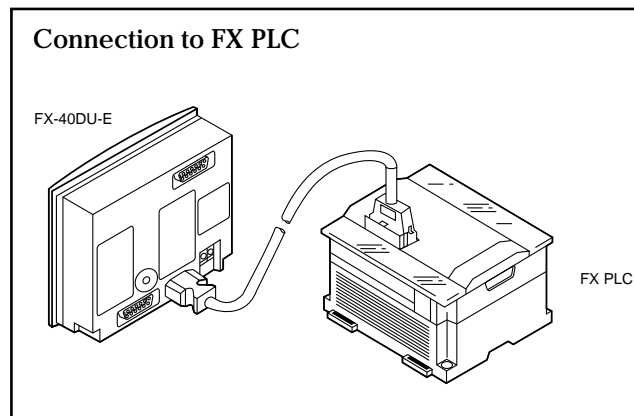
- Bit devices: Up to 12 points can be displayed simultaneously
- Word devices: Up to 6 points can be displayed simultaneously (3 points in the case of timers and counters).

Data sampling function

- 2 specified registers can be sampled either in a fixed cycle or in response to a trigger condition. Up to 2000 data items can be stored for fixed cycle sampling or up to 800 data items for trigger condition sampling
- Sampling data can be displayed in list or graph form
- Sampling data can be printed out on a printer in the form of a broken line graph.

Other functions:

- Integral real time clock
- Data file function that allows storage of data up to 4000 points available in the data register in the PLC and enables transfer of this data to the PLC as required
- Secret entry codes
- RS-232 port can be used with a PC with the display in transparent mode i.e., information passes straight through the display
- 8 switch inputs and 8 switched outputs to and from the display.

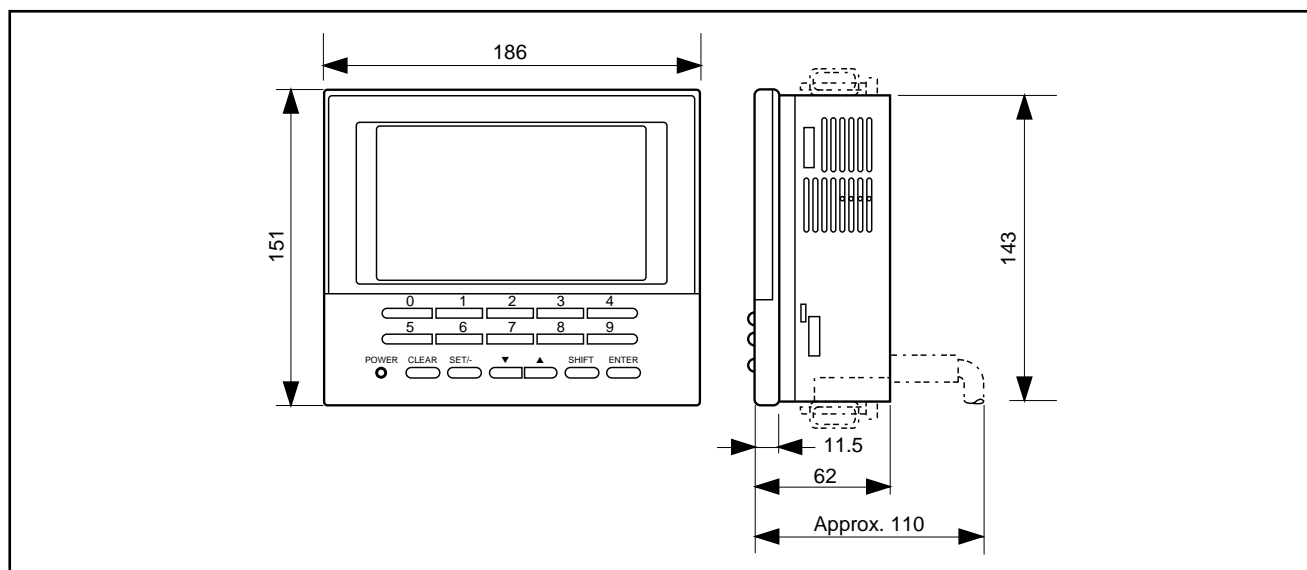


1.1 Display functions

Mode	Function	Function subdivision	Function description
USER SCREEN MODE	Display of user screens		Displays user screens (text and simple graphics such as lines, circles, boxes and bar graphs) and enables switching of the bit devices of the programmable controller ON and OFF (switch function). Also permits the following: Changing of numerical values on displayed screens.
MONITOR MODE	Device monitor	Name	Monitors the ON/OFF status of bit devices identified on the screen by their device numbers and monitors the settings and current values of word devices.
		Comment	Monitors the ON/OFF status of bit devices identified on the screen by their comments and monitors the settings and current values of word devices.
	Current value/ Setting changes	Name	Changing of the current values and settings of word devices identified by their device numbers.
		Comment	Changing of the current values and settings of word devices identified by their comments.
	Forced ON/OFF		Forced switching ON or OFF of programmable controller devices (X, Y, M, S, T, C) either while the programmable controller is running or while it is stopped.
	State monitor		Automatic monitoring of displayed state numbers while the display is ON and operating.
SAMPLING MODE	Sampling condition setting		Setting of the sampling conditions; sampling devices, sampling start, sampling end, etc.
	Result display	List	Display of sampling results in list form.
		Graph	Display of sampling results in the form of a broken line graph.
	Data clear		Clears all sampling data.
EDIT MODE	Screen	Individual screen settings	Setting of screen selection devices, corrections, additions and deletions specific to individual screens.
		Editing	Editing of screens displayed in the USER SCREEN MODE. Corrections, additions, and deletions to text, lines, circles, boxes, bar graphs, switches, etc. ...
		Common settings	Setting of screen selection devices, corrections, additions and deletions common to all screens.
		Data banks	Data bank reading and changing data bank settings.
OTHER MODE	Time setting	Current time	Current time setting (Year, Month, Day, Hour, Minute, Second).
		Alarm time	Setting of alarms for the programmable controller (Hour, Minute).
	Back-light setting		Setting a delay time after which the screen back-lighting will be switched off.
	Personal computer transfer		Transfer of screen data created on a personal computer using the software for creating user screens.
	Printer output		Used to print out sampling data collected in the SAMPLING MODE at a printer.
	Entry code registration		Used to register entry codes in the programmable controller, and to delete or cancel them. (Set values cannot be changed).
	Data through		Used to transfer to the programmable controller programs created on a personal computer with the software for creating programmable controller programs. Also performs monitoring. Uses the display as an RS232C/422 converter.

2. Specifications

2.1 Dimensions



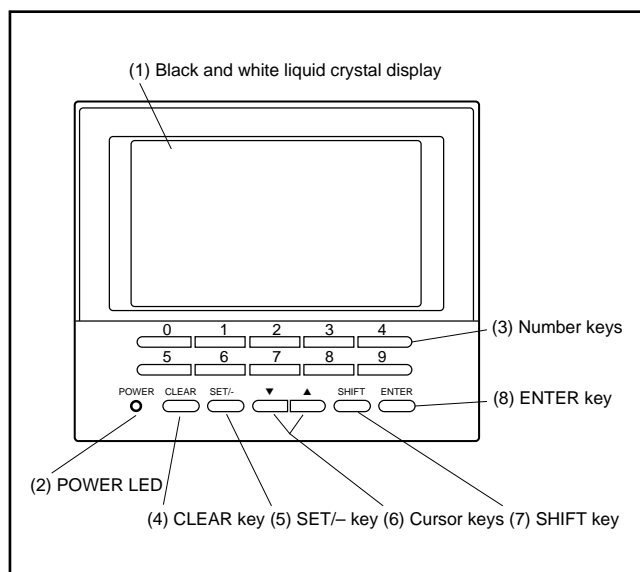
2.2 General specifications

Ambient temperature	0 to 40°C during use	
Ambient humidity	35 to 85% RH (with no condensation) during use	
Vibration resistance	Conforms to JIS C0911; 10 to 55Hz, 0.5G, 2 hours in each of 3 axis directions	
Impact resistance	Conforms to JIS C0912; 10G, 3 times in each of 3 axis directions	
Noise resistance	Noise voltage: 1,000 Vp-p, noise width: 1μs, determined by 30 to 100Hz noise simulator	
Voltage resistance	500Vac for 1 minute	Measured between external I/O connector pins/power supply terminals and the ground terminal.
Insulation resistance	At least 5MΩ measured with 500Vdc megger	
Grounding	Class 3 grounding. If grounding is not possible the unit can be left without grounding.	
Operating environment	There must be no corrosive gases and no excessive dust.	
Screen	240 3 128 dot liquid crystal (with back-light) 7 lines of 15 characters (2-byte characters)	
Life of components	Liquid crystal: Approx. 50,000 hours Back-light: At least 10,000 hours (has automatic switch off function) Battery: Approx. 5 years Note: The guarantee period of these components is one year.	
Keys	16 keys	
Interfaces	One channel conforming to RS422 standards	
	One channel conforming to RS232C standards	
	External I/O: input; 8 points (7mA/24Vdc) Output; 8 points (20mA/point)	
External I/O connector	Suitable connectors (made by Fujitsu): FCN-361 J024-AU, FCN-361 J024-AG	
IP rating	IP53	
Weight	1kg (including brackets; 0.1kg)	

2.3 Functions of the operation keys and connectors

2.3.1 Front panel

The names and functions of the keys are explained below:



1. Black and white liquid crystal display

This is a 240 x 3128 dot graphic display area.

Text capacity:

7 lines of 15 two-byte characters or 7 lines of 30 one-byte characters (it is also possible to display characters enlarged by a factor of 2 to 4 in the horizontal and vertical directions).

The screen can display letters of the alphabet and numerals.

Simple graphic capabilities: Lines, boxes, circles.

2. Power LED

This LED is lit while power is being supplied to the display.

3. Number keys

These keys are used to input numerals when specifying device numbers in the MONITOR MODE or SAMPLING MODE, changing settings or current values, or specifying screen change numbers.

4. CLEAR key

This key is used to clear input data, to cancel error messages and to return to the previous screen when any mode operation screen is displayed.

5. SET/- key

This key is used to open function windows and set data and to ascribe a minus sign when inputting settings and current values.

6. Cursor keys

These keys are used for selection purposes including scrolling the displayed screen and specifying device numbers in the MONITOR MODE.

7. SHIFT key

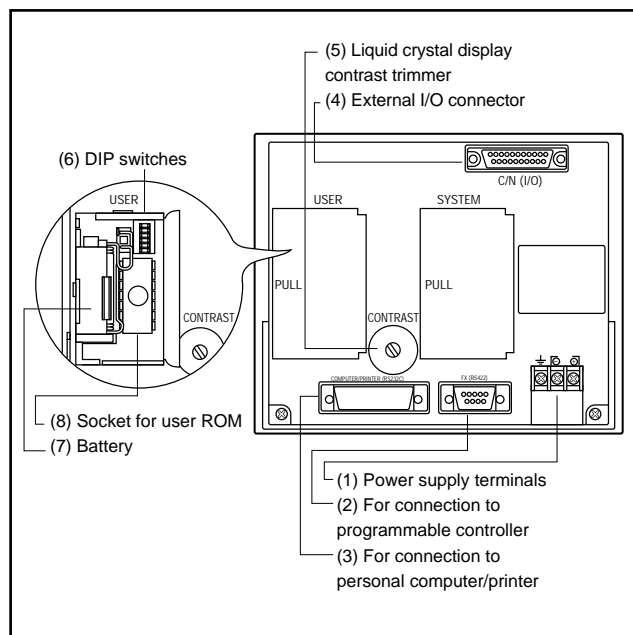
This key is used in conjunction with other keys (for example the number keys or cursor keys) to alter the input.

8. ENTER key

This key is used to execute operations in each mode and to set and execute input data.

2.3.2 Rear panel

The names and functions of the connectors switches and terminals on the rear panel are detailed below:



1. Power supply terminals

These terminals accept the display power supply and grounding wires.

2. Socket for connection to programmable controller (RS-422 connector)

Used to enable communication with the programmable controller.

The FX-40DU-CAB cable is connected between this socket and the programmable controller.

3. Socket for connection to personal computer/printer.

Used to transfer screen data created using the screen creation software kit to the programmable controller and to print out sampling data collected in the SAMPLING MODE at a printer. The 232CAB cable supplied with software RS stock no. 849-142 is used to make the connection to the personal computer or printer.

4. External I/O connector

Used to receive input from external keys, switches, etc. and to output to lamps, relays, etc.

5. Liquid crystal display contrast trimmer

Used to adjust the brightness of the liquid crystal display.

6. DIP switches

Used to set initial settings such as the display priority of displayed screens.

7. Battery

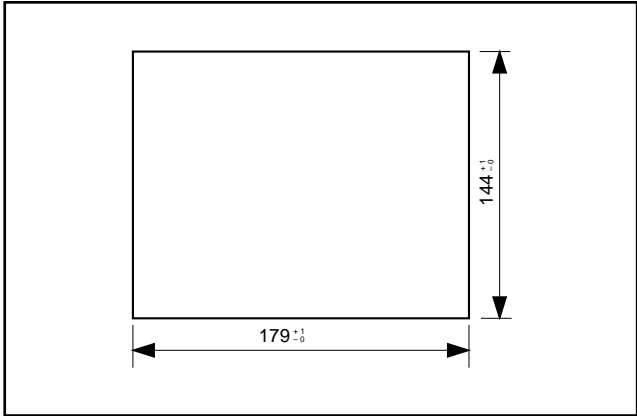
Used to preserve the user RAM memory and stored data.

8. Socket of user ROM

When user screen data created using the screen creation software kit is written to a ROM using a ROM writer, the ROM can be inserted into this socket to enable ROM operation. When inserting or removing the ROM, take care not to bend the ROM leads or touch them directly with the fingers.

Note: The display incorporates an integral RAM; the ROM is an option.

2.4 Panel cut out dimension



Note: The panel in which the unit is installed should have a thickness of no greater than 5mm.

2.5 Power supply specifications (can be supplied from the FX base or extension unit)

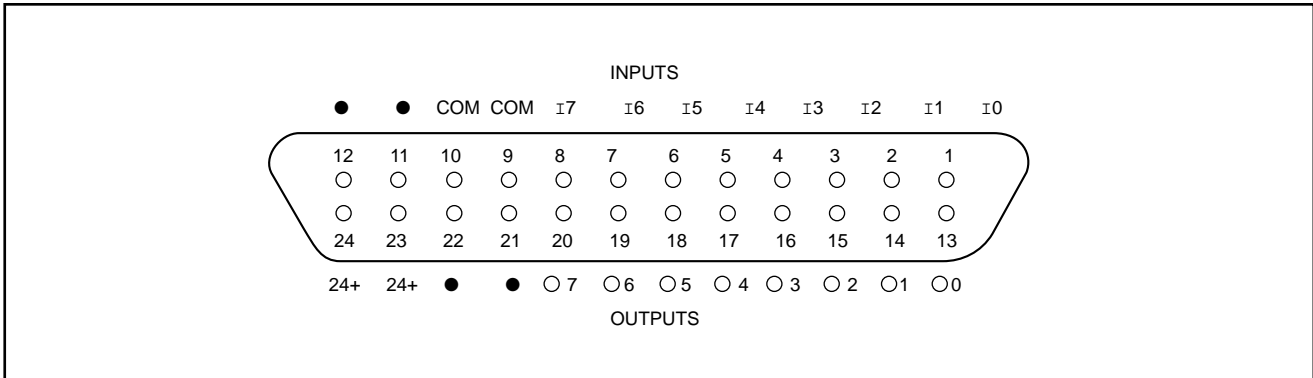
Item	Specification
Power supply voltage	24Vdc +10%/-15%
Power supply ripple	No greater than 200mV
Current consumption	220mA max./24Vdc
Permitted momentary power failure	Operation will continue through momentary power failure up to 5ms in duration

2.6 Inputs/Outputs specification

Input signal voltage	Input signal current	Circuit insulation	Input response time	Number of input points
24Vdc +10%/-15%	7mA/24Vdc	By photo-coupler	Approx. 4ms	8

Output method	Rated current	Load voltage	Circuit insulation	Response time	Number of output points
Transistor output	20mA/point	24Vdc +10%/-15%	By photo-coupler	1ms max.	8

Arrangement of external I/O connector pins on display



3. User screen mode

The following are a selection of typical screens. The first or top screen is always a menu of options screen, called the mode selection screen. The cursor is moved up and down the menu by using the arrows on the keypad and the appropriate mode is displayed by moving the cursor onto the chosen mode and then pressing the ENTER key.

1. Mode selection screen

[SELECT MODE]

1. USER SCREEN MODE

2. MONITOR MODE

3. SAMPLING MODE

4. EDIT MODE

5. OTHER MODE

2. User screen or mode screen

[SAMPLING MODE]

SET CONDITION

DISPLAY LIST

DISPLAY GRAPH

CLEAR DATA

3. User screen No. 0

MITSUBISHI

000FX-40 DU-E
13: 29: 05

PRODUCTION STATUS
56238

RUNNING

STOP

EMERGENCY STOP

4. User screen No. n

PRODUCTION MANAGEMENT

NUMBER OF PRODUCTS

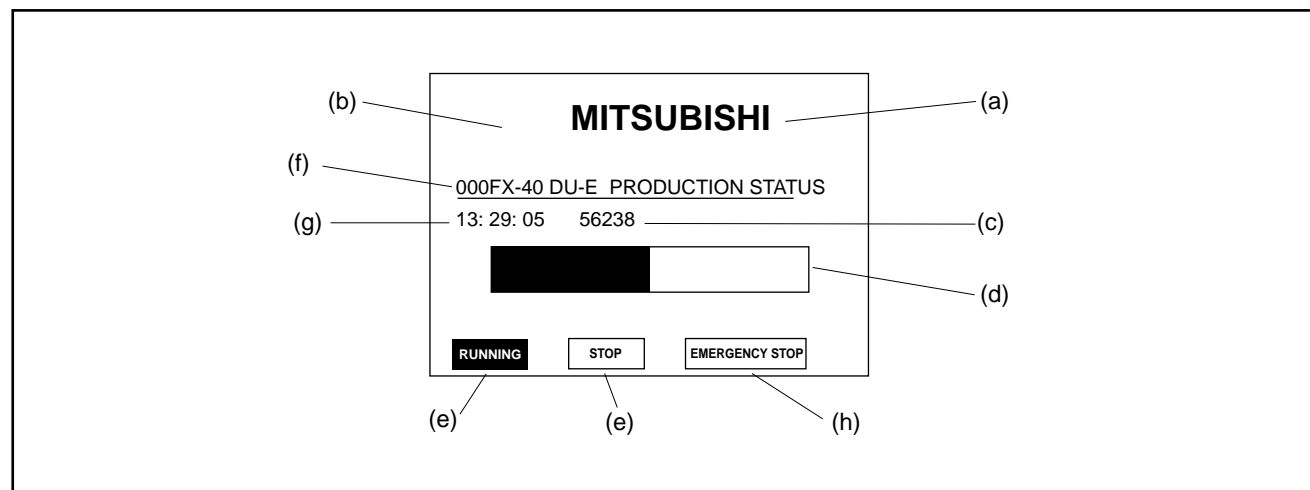
1234

OPERATING RATE

100%

3.1 Screen configuration

The fourteen types of objects listed below are described in general terms here by reference to an example screen. The screens are programmed in the user display mode using these object types.



- | | |
|---------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1. TEXT | ... Displays characters and symbols such as letters of the alphabet, numerals and user-defined characters (customised characters). Customised characters are registered using the screen creation software.
Examples: (a), (b). |
| 2. ASCII | ... Displays characters and symbols stored as ASCII codes in data registers of the programmable controller. |
| 3. NUMBER | ... Displays programmable controller word devices (T and C current values and settings, D,V,Z) at the specified locations.
Example: (c). |
| 4. BAR GRAPH | ... Displays programmable controller word devices (T and C current values and settings, D, V, Z) in bar graph form.
Example: (d). |
| 5. LAMP | ... Highlights specific areas of the screen in accordance with ON/OFF control of programmable controllers bit devices.
Example: (e). |
| 6. LAMP (EXT) | ... Switches external outputs ON/OFF in accordance with ON/OFF control of programmable controllers bit devices. |
| 7. LINE | ... Displays a line between two specified points.
Example: (f). |
| 8. BOX | ... Displays a square box on the screen. |
| 9. CIRCLE | ... Displays a circle on the screen. |
| 10. DATE | ... Displays the year, month, date and day of the week. Display in reverse is also possible. |
| 11. TIME | ... Displays the hour, minute and second. Display in reverse video is also possible.
Example: (g). |

Objects that are not displayed on the screen:

- | | |
|-------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 12. SWITCH | ... Used to control the ON/OFF status of programmable controller bit devices, or external outputs, in accordance with display operation key inputs or inputs from external equipment. |
| 13. DATA BANK | ... Stores data up to a quantity equal to the capacity of the 4,000 data registers of the programmable controller and in response to specific inputs, transfers data stored in specified data registers. |
| 14. CHANGE SCREEN | ... Sets the conditions under which a screen is changed and which screen is displayed when the change is made. |

Notes:

- A number of objects can be used in combination with each other. For example, display example (e) demonstrates the combined use of LAMP, TEXT and BOX objects, while display example (h) demonstrates the combined use of SWITCH, TEXT and BOX.
- The displayed current value of NUMBER and BAR GRAPH objects can be changed by using the [SET] key.
- The number of objects that can be used in one screen and the memory requirement, differ for each object. However, ensure that no more than 64K bytes is taken up by object registration with the maximum of 256 screens.

4. FX PLC Device list

Device type		Specifications		Remarks
Auxiliary relays	General use	500 points		0 to M499
	Latch use	524 points		M500 to M1023
	Special use	256 points		M8000 to M8225
States	Initial use	10 points		S0 to S9
	General use	490 points		S10 to S499
	Latch use	400 points		S500 to S899
	For annunciator	100 points		S900 to S999
Timers	100ms	200 points (0.1 to 3,276.7 seconds)		T0 to T199
	10ms	46 points (0.01 to 327.67 seconds)		T200 to T245
	1ms totalling type	4 points (0.001 to 32.767 seconds)		T246 to T249
	100ms totalling type	6 points (0.1 to 3,276.7 seconds)		T250 to T255
Counters	Up counters	16-bit Count: 1 to 32,767	General use 100 points	C0 to C99
			Battery back-up 100 points	C100 to C199
	Up/down counters	32-bit -2,147,483,648 to 2,147,483,647	General use 20 points	C200 to C219
			Battery back-up 20 points	C220 to C234
	High speed counters	32-bit up/down	Battery back-up 6 points	C235 to C254
Registers	General data registers	16-bit	General use 200 points	D0 to D199
		16-bit	Battery back-up	D200 to D511
	Special use	16-bit 256 points		D8000 to D8255
	For index	16-bit 2 points		V, Z
	For data banks	16-bit (in the program memory)	Battery back-up	D1000 to D2999
Pointers	JUMP, CALL use	14 points		P0 to P63
	For interrupts	9 points (input interrupt and timer interrupt by input 3 0 to 5)		I0 [] [] to I8 [] []
Nesting		8 points, for master control		N0 to N7
Constants	Decimal K	16-bit: 32,768 to 32,767		32-bit: 2,147,483,648 to 2,147,483,647
	Hexadecimal H	16-bit: 0 to FFFF _H		32-bit: 0 to FFFFFFFF _H

5. PC based programming software (RS stock no 849-142)

5.1 Main functions

Main functions of the software are:

Creation of screen data/setting data

- Screen data which enable screens to be displayed by the 40DU-E can be created by using a personal computer and the software.
- User-defined characters (character patterns) can be created and registered.
- Device comments can be created using letters of the alphabet and numerals.
- Sampling conditions can be set, and the sampling result data (PLC device information) stored in the 40DU-E can be collected by the personal computer in accordance with the set conditions.

Transfer of screen data/setting data

Screen and setting data can be transferred to and from the following external devices:

- The 40DU-E (internal memory)
- The user's floppy disk or hard disk
- A general purpose printer
- The ROM writer.

5.2 File management

General description of functions

General descriptions of file management functions are given below:

- **Creating a file** - Data on the screen can be cleared, and new data can be created and set.
- **Reading a file** - An existing data file can be read and edited. Data on the screen is cleared, and the data read, is displayed.
- **Making a directory** - A new directory can be made when writing to a file.
- **Deleting a directory** - An existing directory can be deleted when deleting a file.
- **Writing to a file** - Created/set data can overwrite an existing file. It can also be written to a new file.
- **Deleting a file** - An existing file can be deleted.

Types of user files

User files which can be handled by the software:

- **File name. GDT** (screen data file):
Contains screen information (screen data, user-defined character data, comment data, or numerical data (data bank)).
- **File name. SDT** (sampling result data file):
Contains sampling result information (sampling data collected from the 40DU-E).
- **Sampling name. PTL** (printer title data file)
Contains printer title information.

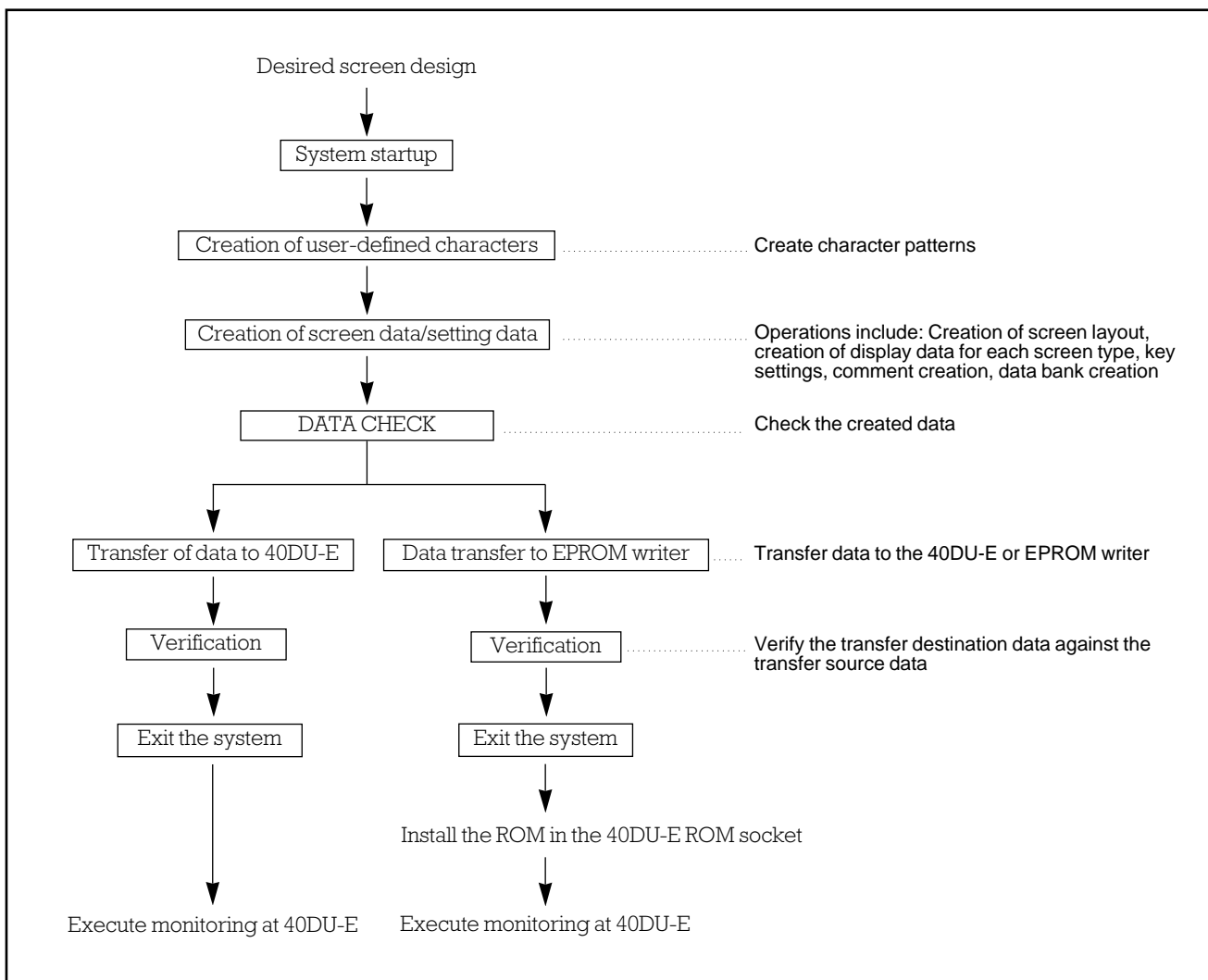
5.3 Specifications

Specifications which relate to the setting of the software.

Item	Specifications	
Number of screens that can be created	Max. 256 per screen data file	
Number of objects that can be set	Max. 255 per screen	
	Max. 65280 (255 objects × 256 screens) per screen data file	
Number of user-defined characters that can be registered	Max. 128 per screen data file	
Number of numerical data files handled by the data bank function	Max. 4000 files per screen data file	
File capacity	Max. 64Kbyte per screen data file	
	Max. 8Kbyte per sampling result data file	
	Approx. 300 Kbytes per printer title data file	
Total number of samplings	Time-triggered	1 to 2000 times
	Device-triggered	1 to 800 times
Minimum sampling setting interval.	1 second (time-triggered sampling)	

5.4 Procedure outline

The diagram below shows a typical design process using the software.



5.5 Software package contents

These include:

- 3.5 and 5.25 inch DSDD disks
- PC to display cable
- Software user manual.

5.6 System configuration

Minimum PC requirements:

- MS-DOS version 3.1 or higher
- 640 Kbytes memory
- Colour EGA monitor
- RS-232C built-in interface
- Serial type mouse, Microsoft compatible.

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